Mangrove plantation at abandoned shrimp ponds in Nakhon Si Thammarat: Restoring biodiversity and countering climate change

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Planted in 2000

20 years old mangrove forest at along waterway abandoned shrimp ponds, Pak Poon, Nakhon Si Thammarat, Thailand

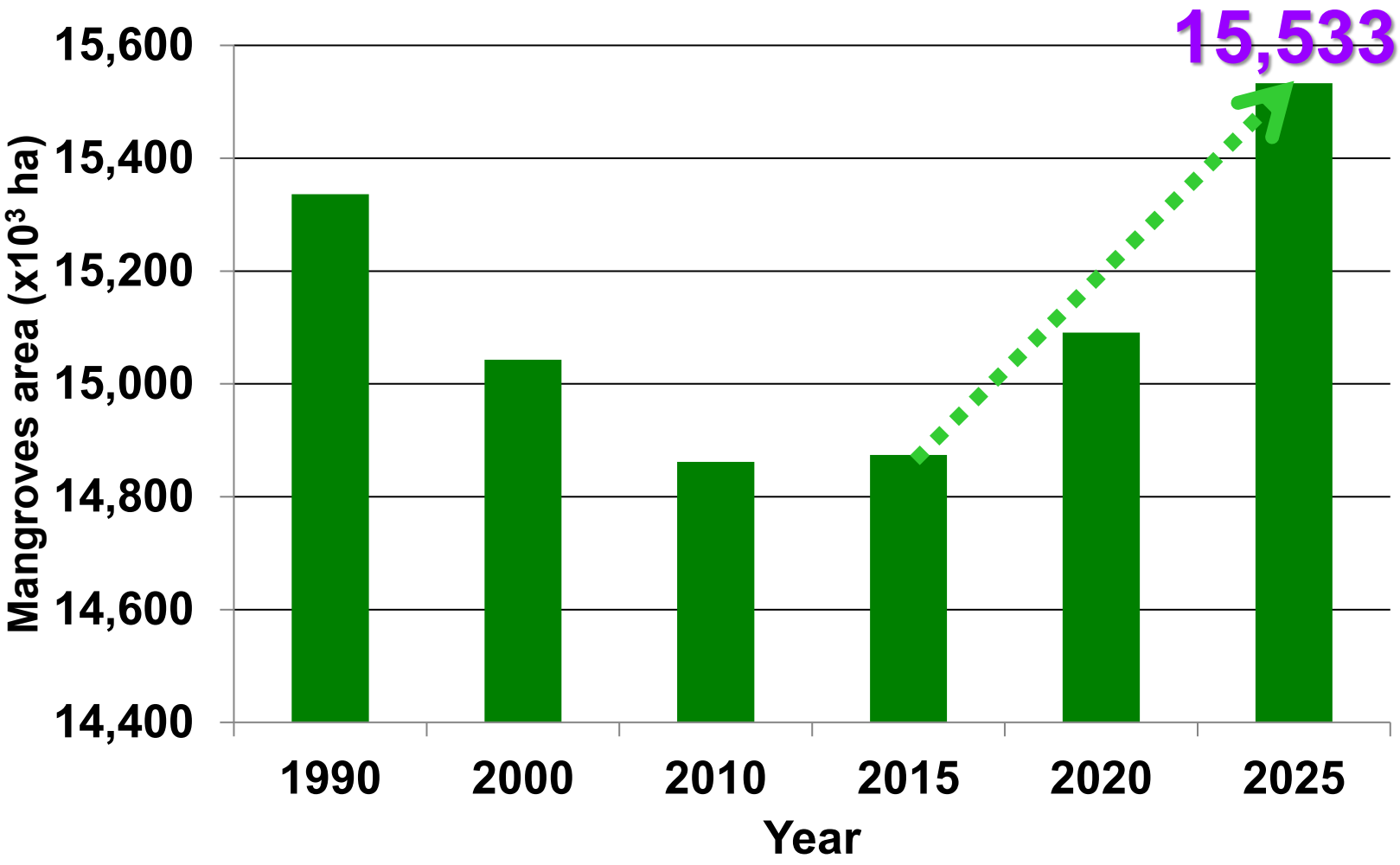
Items

1. Operation *"Green carpet"*

2. Food Chain in Fishes of mangroves areas

3. eDNA analysis of Pak Phanang Bay

4. Conclusion



Total area of mangroves,
1990 - 2025

Source: Global Forest Resources Assessment 2025,Rome (21-Oct. 2025)

Objectives of the "Green Carpet" Project

1. Restoring of mangrove forests and Carbon accumulation/storage.

2. Improving the coastal environment and increasing sustainable biological production/promoting for regional/local development.

3. Actively engaging local communities through mangroves afforestation/rehabilitation.

4. Planting mangroves on 1,000 hectares of abandoned shrimp ponds.

Abandoned shrimp ponds in Nakhon Si Thammarat

(In the 1980s)

One year

2 years

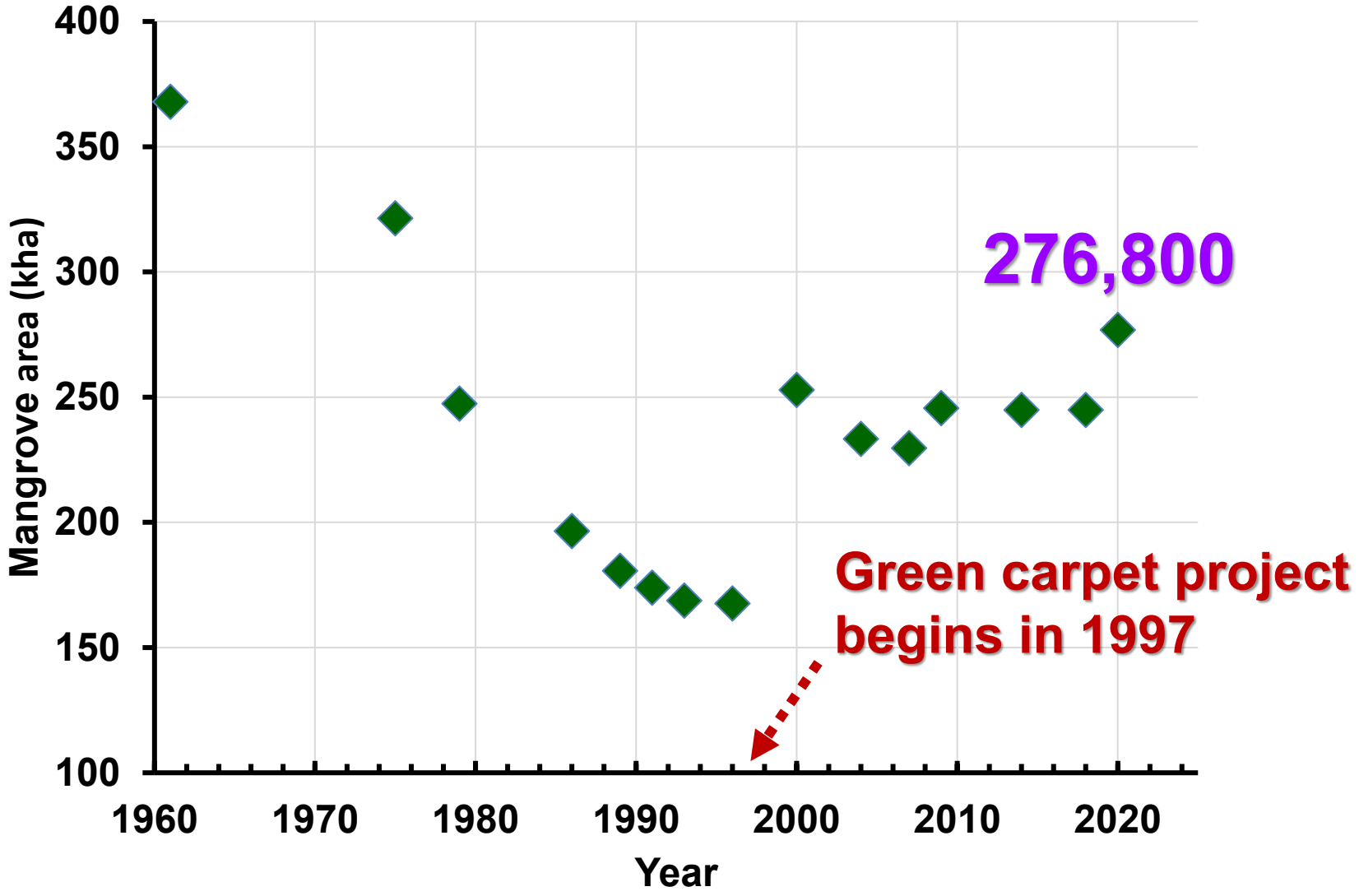
3 years

4 years

Mangrove trees planted along a waterway in 2000

(The forest stretches for several kilometers and is over 14 meters tall.)

Mangrove planting has resulted at abandoned shrimp ponds and new mudflats areas, allowing a diverse range of organisms to return and providing an ideal feeding ground for birds.



Changes of Thailand mangroves forests

Source: Department of Marine and Coastal Resources

Satellite image of abandoned shrimp ponds areas

（Google map, early 1990s）

Satellite image of abandoned shrimp ponds areas

（Google map, October 2025）

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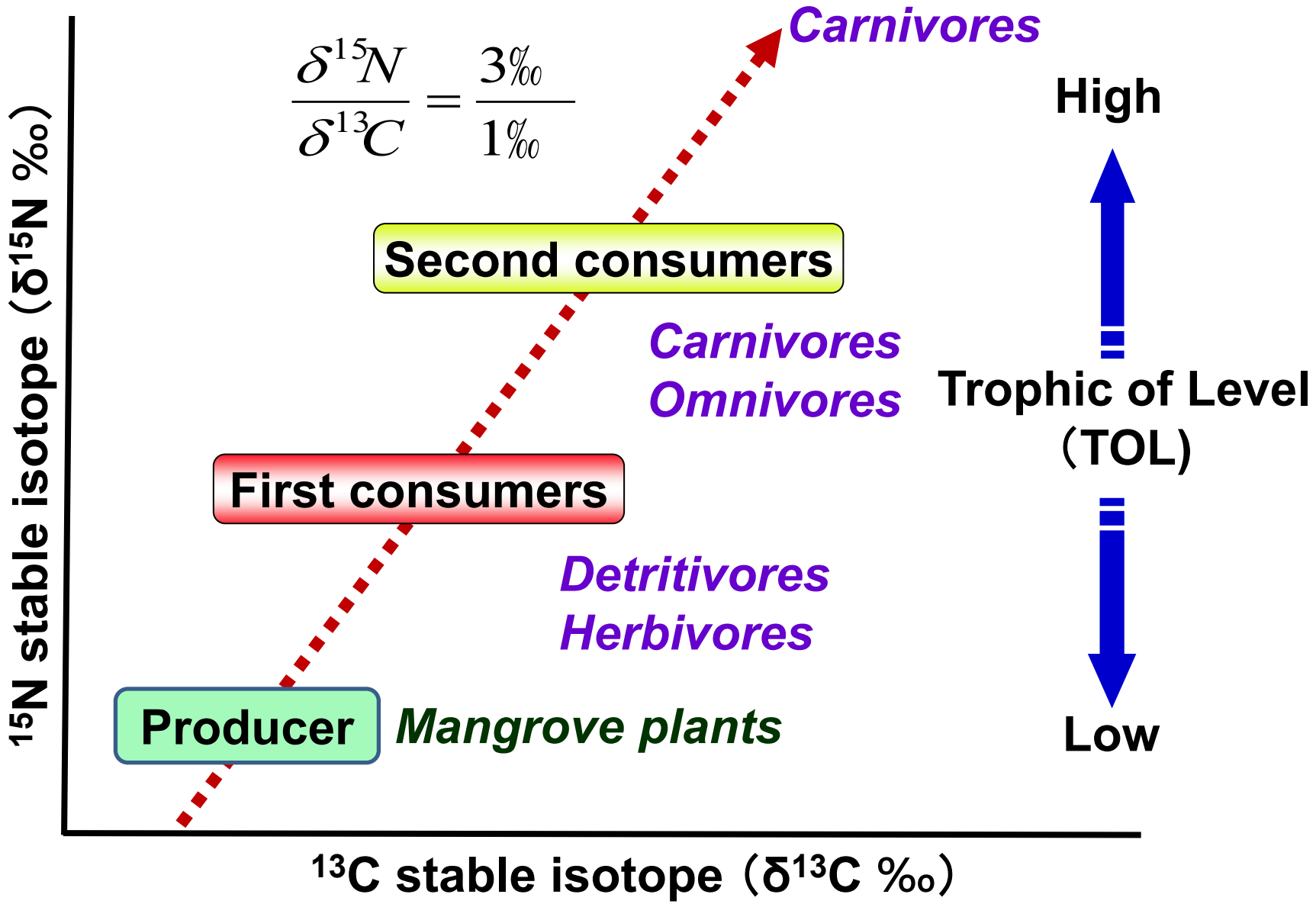
Collection of fish sample

(with the cooperation of local fishermen)



Food web study of abandoned shrimp ponds areas through stable isotope ^{13}C and ^{15}N in fishes

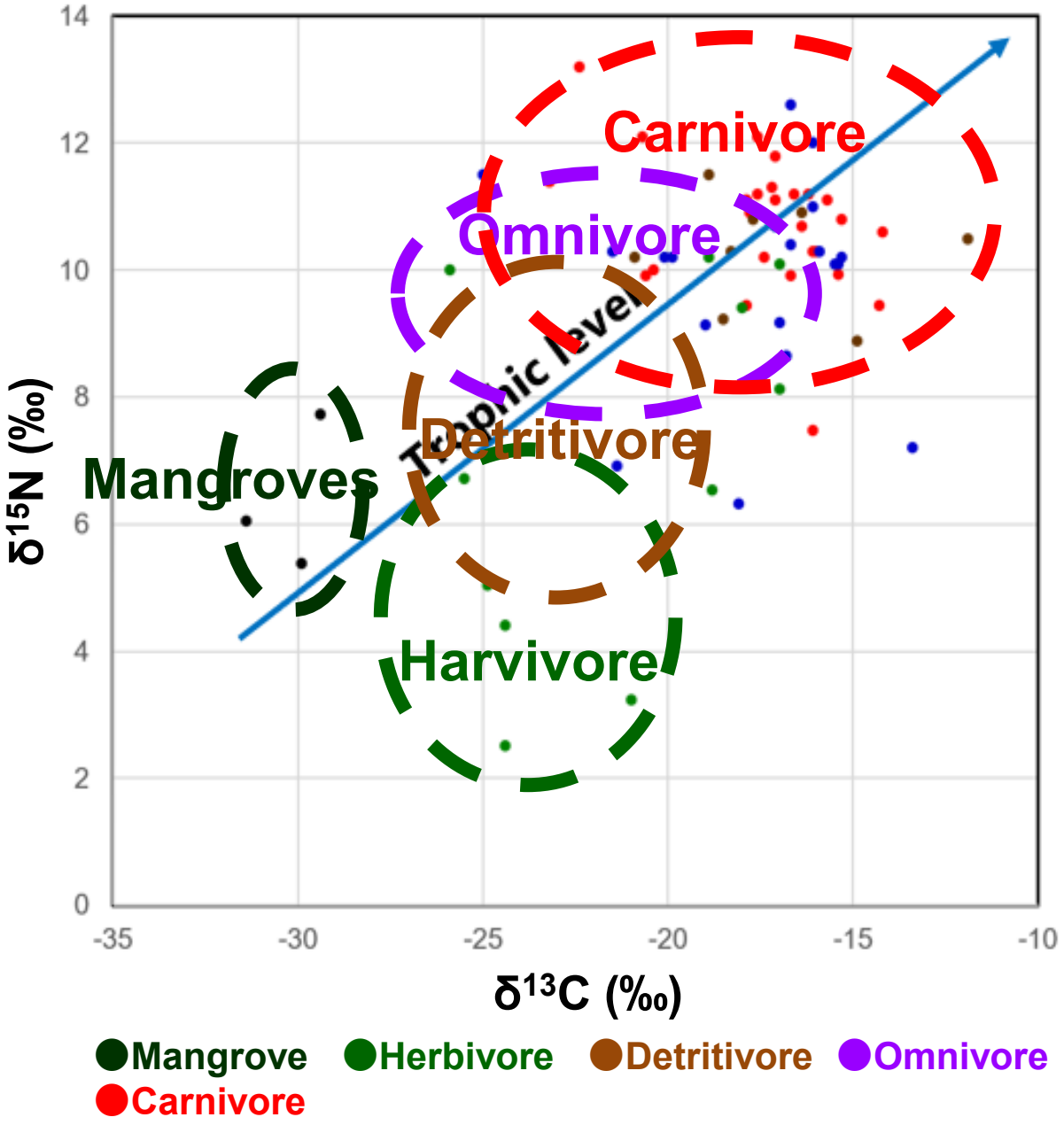
Food type classification of collected fishes, crabs, shells and shrimps

Sample	Herbivore	Detritivore	Omnivore	Carnivore	Total
Fish	6	4	6	30	46
Shell	4	-	1	-	5
Crab	3	1	1	2	7
Shrimp	-	-	1	4	5
Total	13	5	9	36	63

※Also, Leaves of Rhizophora apiculate and R. mucronate were collected in mangrove forests.

※Fish sampling was supported by local fishermen.

<Results>

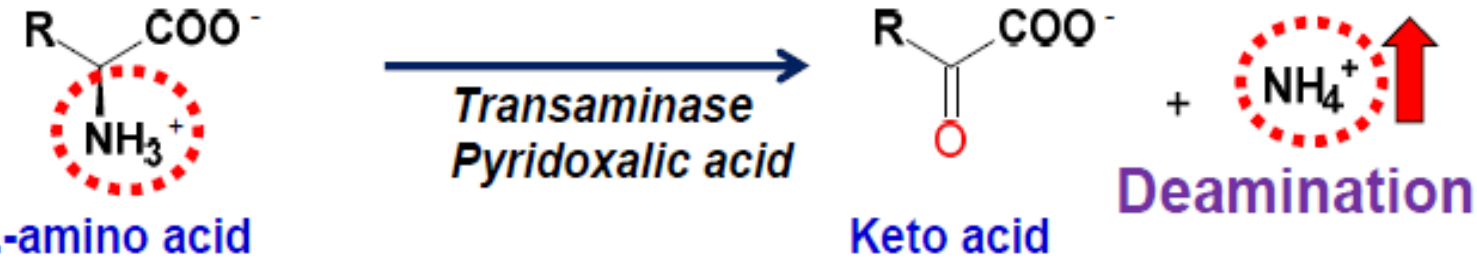


Stable ^{13}C and ^{15}N isotopes in fish samples

After afforestation, mangrove mud crabs recovered as a result of mangrove planting.

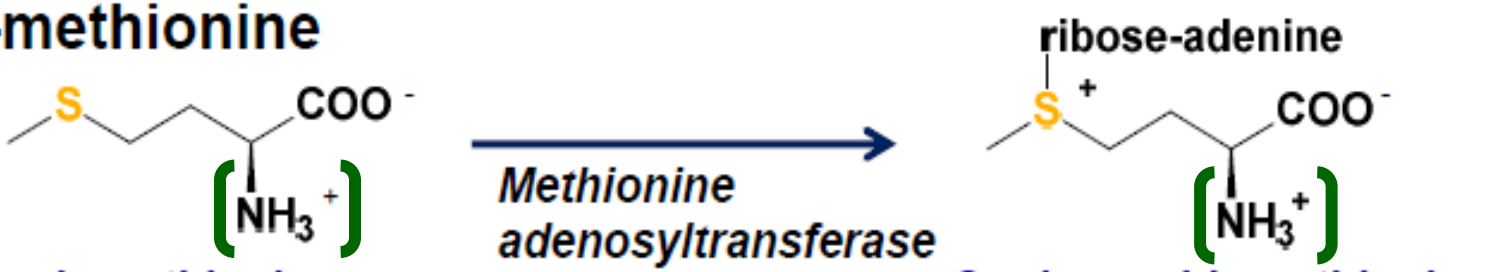
<Result>

(a) L-alanine, L-valine, L-leucine, L-glutamic acid etc.



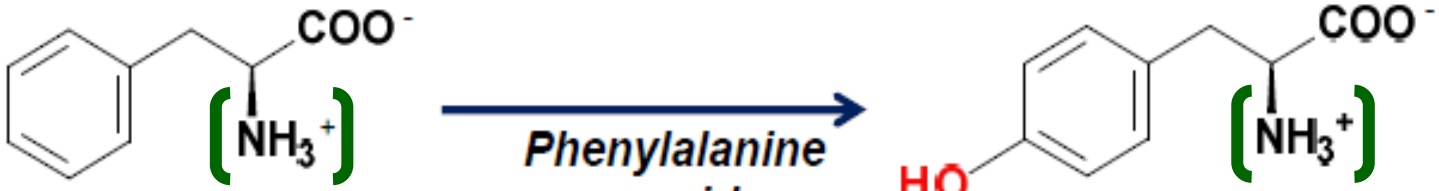
L-amino acid　　Keto acid

(b) L-methionine



L-methionine　　S-adenosyl-L-methionine

(c) L-phenylalanine



L-phenylalanine　　L-tyrosine

Assumed enzymatic deamination of amino acids in fishes and shellfishes

***Rachycentron canadum*, Cobia (common name)**

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<Forecast our study on eDNA at Pak Phanang Bay>

Environmental DNA

- Environmental DNA (eDNA) is the genetic material left by organisms in the environment.
- eDNA is increasingly being used to detect the presence of species and assess biodiversity, but broad-scale best practices are still being developed.
- This affects the quality, accessibility, and usefulness of data.
- Non-invasive eDNA sampling can complement or enhance conventional approaches, as it can be a highly sensitive, rapid, and cost-effective tool for biodiversity monitoring.
- Creating unified eDNA data best practices and developing DNA reference libraries will ensure eDNA detection methods are applied consistently to accurately inform conservation and wildlife manage.

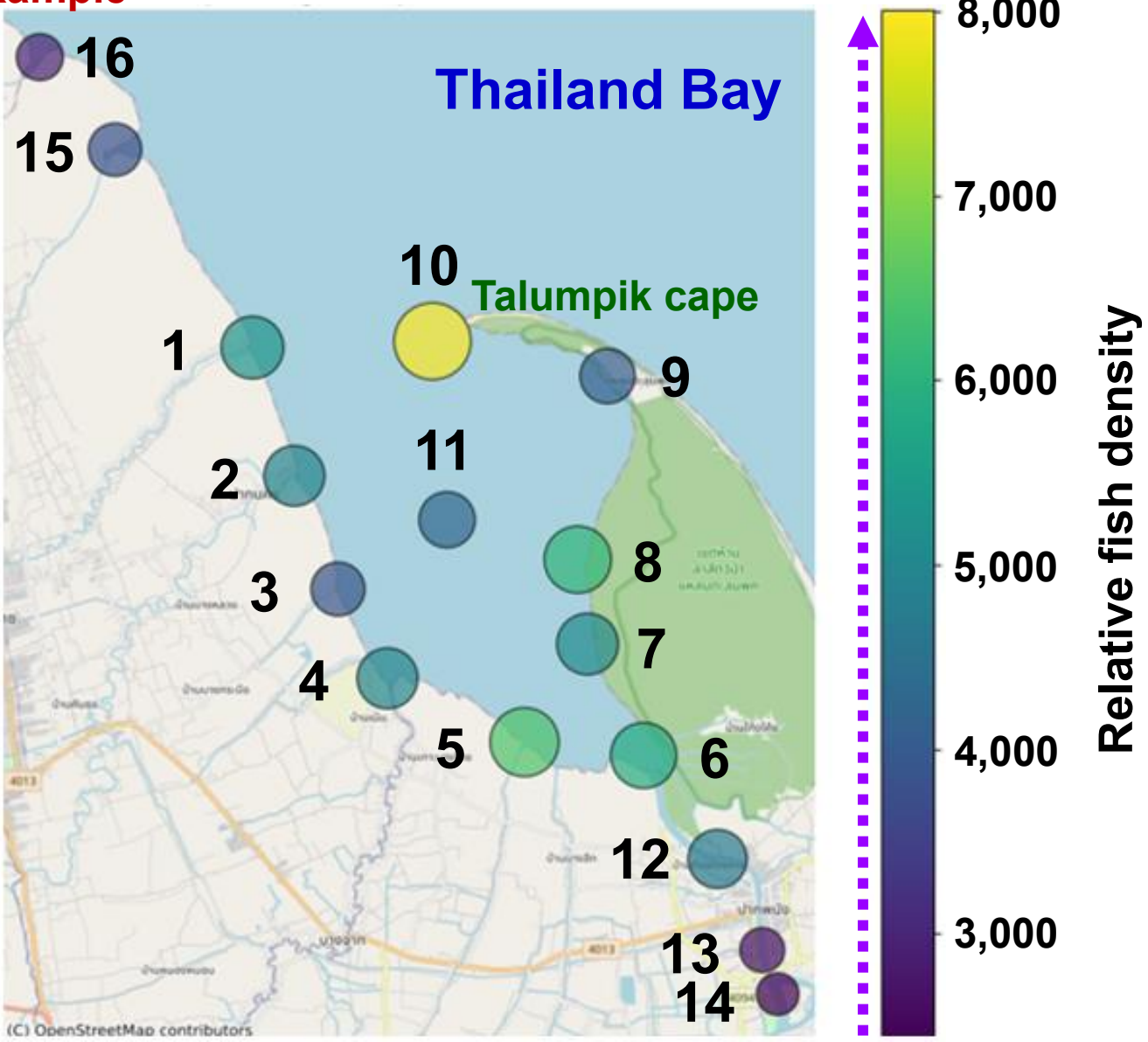
https://iucn.org/resources/issues-brief/environmental-dna#22839

Identified fish species in sea water of January 2025 at Pak Phanang Bay

Scientific name	Point of fish species confirmation
Ancistrus martini	1
Butis gymnopomus	5
Collichthys niveatus	6
Crystallichthys cyclospilus	15
Etmopterus gracilispinis	1～16
Gerres oyena	1～15
Pimephales promelas	10,13
Pseudoloricaria laeviuscula	5

Special thanks: Dr. Motohiro Akashi, Dr. Christine Dwi A. P. Wiyono, Mr. Hao Konishi and Mr. Yoshiki Sema

<Forecast as example>



Distribution of *Etmopterus gracilispinis* in Pak Phanang Bay

Special thanks: Dr. Motohiro Akashi, Dr. Christine Dwi A. P. Wiyono, Hao Konishi and Yoshiki Sema

Items

1. Introduction of *"Green carpet"* project
2. Carbon and Nitrogen accumulation in mangroves and soils
3. Food Chain in Fishes of mangroves areas
4. Conclusion

<Conclusion>

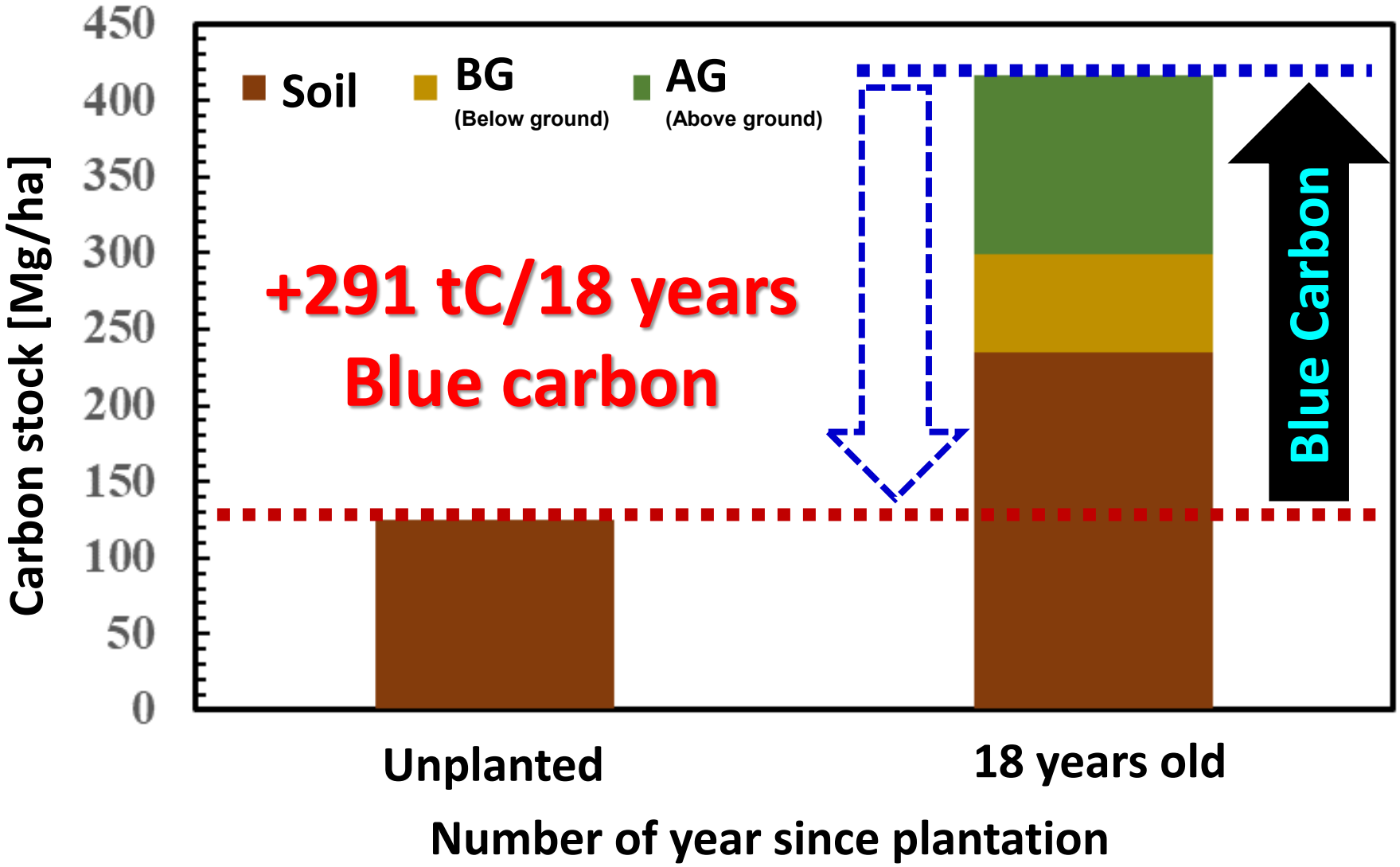
Contributions of large-scale mangrove planting

- Biomass production and carbon accumulation as Carbon sink/storage (blue carbon sinks)
- Element cycle in mangroves/coastal ecosystems
- Contributing to the creation and rebuild of a sustainable biodiversity ecosystems
- Regional revitalization and environmental awareness

Thank you !

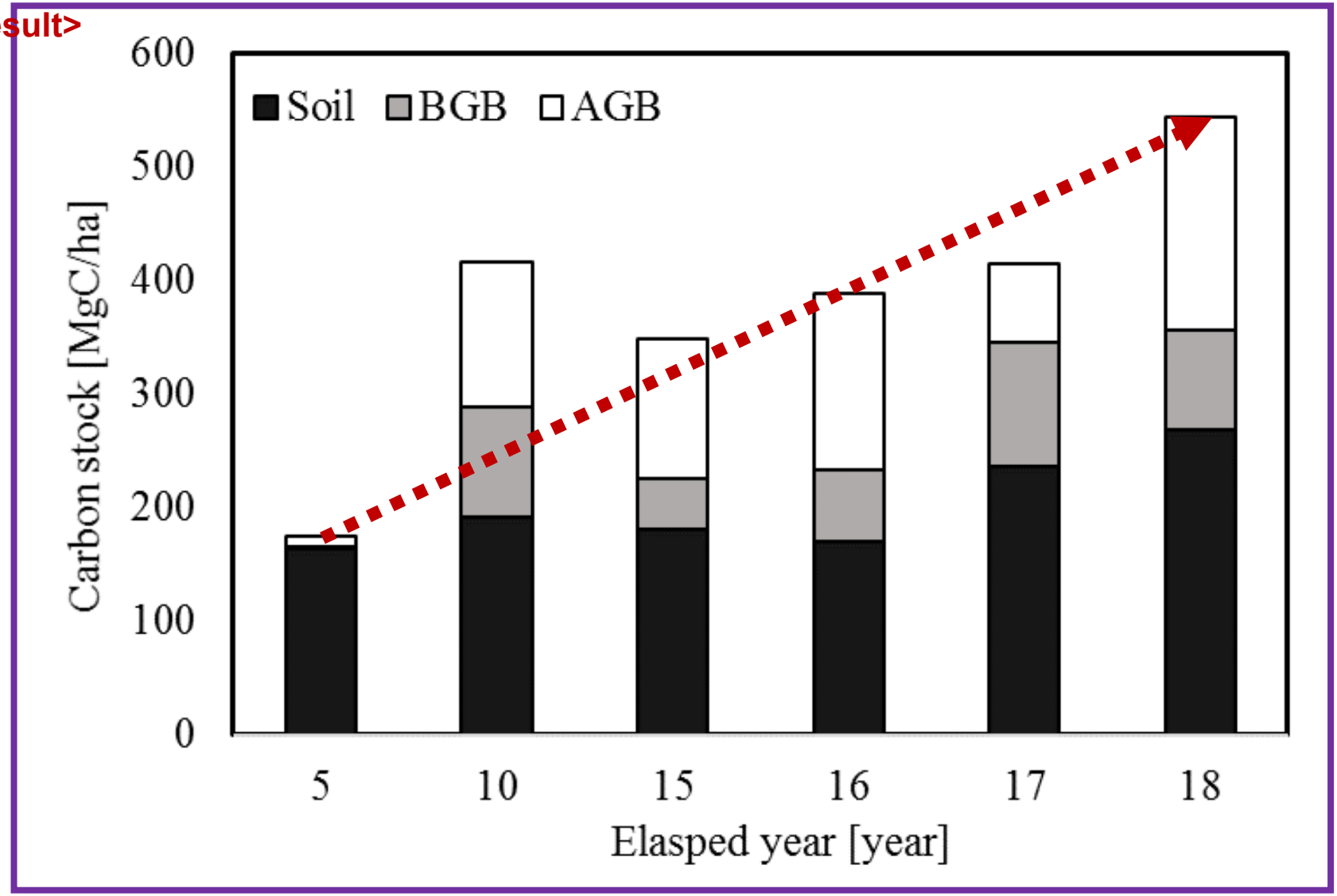
ขอบคุณ

Habitat distribution of *Periophthalmus argentilineatus* is new mudflats in tropical and subtropical of the world



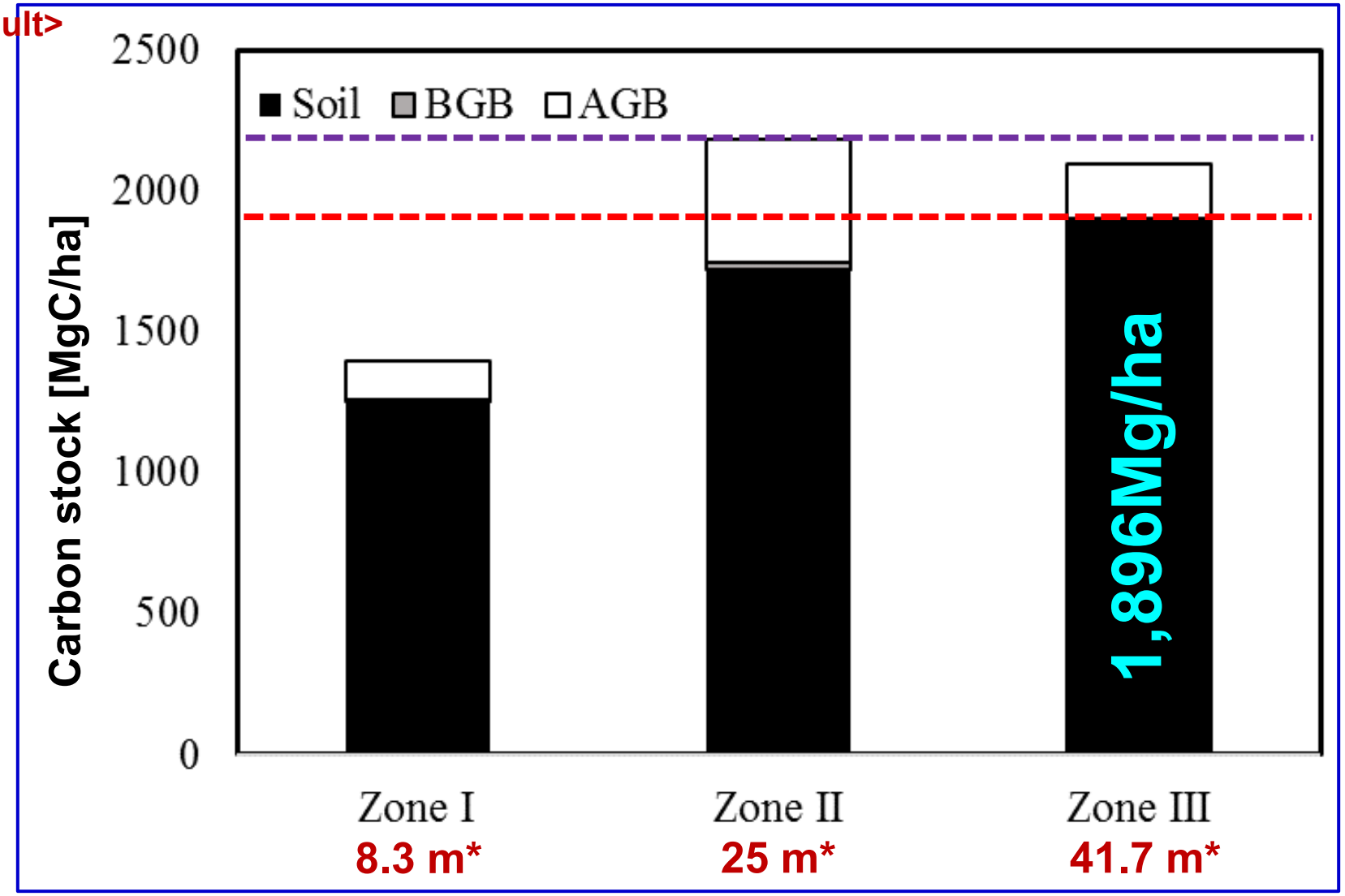
Carbon stock/accumulation in abandoned shrimp ponds plantations

<Result>



Total carbon fixation through afforestation of abandoned shrimp ponds at Pak Poon, NST

<Result>



Total carbon fixation at Khanom mangrove forests in Nakhon Si Thammarat, Thailand

m*: Distance of soil sampling site from waterway